

SEQUENCE LISTING

<110> Klebsattel, Martin
Sauer, Matt
Flachmann, Ralf
Schopfer, Christel Renate

<120> Process for the preparation of beta-carotenoids

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<150> PCT/EP2003/009101
<151> 2003-08-18

<150> DE 102 38 980.2
<151> 2002-08-20

<150> DE 102 38 979.9
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<150> DE 102 58 971.2
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<170> PatentIn version 3.3

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Thr Thr Lys Lys Lys Ser Arg Lys Cys Leu Leu Arg Asn Lys Ser Ser
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Ser Leu Asp Val Asn Ile Ser Trp Val Asp Pro Asn Ser Asn Arg Ala
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Gly Ala Pro Trp Gly Met Phe Leu Gly Pro Gln Glu Leu Gln His Ile			
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Gln Gln Leu Asp Arg Ala Ile Ala Glu Arg Arg Ala Arg Arg Lys Arg
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Glu Gln Leu Ser Tyr Gln Ala Ala Ala Ile Ala Ala Ser Ile Gly Val
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Ser His His Thr Pro Arg Thr Gly Pro Phe Glu Ala Asn Asp Leu Phe
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Trp Leu Pro Asn Val Leu Gly Ala Ala Cys Phe Gly Ala Gly Leu Gly
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Ile Thr Leu Tyr Gly Met Ala Tyr Met Phe Val His Asp Gly Leu Val
 245 250 255

His Arg Arg Phe Pro Thr Gly Pro Ile Ala Gly Leu Pro Tyr Met Lys
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Arg Leu Thr Val Ala His Gln Leu His His Ser Gly Lys Tyr Gly Gly
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 Pro Thr Ser Thr Thr Ser His Val Ser Pro Ile Ser Pro Phe Ser Leu
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 Asn Leu Gly Pro Ile Leu Arg Ser Arg Arg Lys Pro Ser Phe Thr Val
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Ala Arg Lys Lys Ser Glu Arg Phe Thr Tyr Leu Val Ala Ala Ile Met
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Lys Gln Ile Lys Cys Asn Ala Ala Lys Ser Gln Leu Val Val Lys Gln	
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Glu Ile Glu Glu Glu Glu Asp Tyr Val Lys Ala Gly Gly Ser Glu Leu	
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Ala Leu Ala Gly Glu Ser Ala Lys Leu Gly Leu Asn Val Ala Leu Ile	
110 115 120	
ggc cct gat ctt cct ttt aca aat aac tat ggt gtt tgg gag gat gaa	557
Gly Pro Asp Leu Pro Phe Thr Asn Asn Tyr Gly Val Trp Glu Asp Glu	
125 130 135	
ttt ata ggt ctt gga ctt gag ggc tgt att gaa cat gtt tgg cga gat	605
Phe Ile Gly Leu Gly Leu Glu Gly Cys Ile Glu His Val Trp Arg Asp	
140 145 150 155	
act gta gta tat ctt gat gac aac gat ccc att ctc ata ggt cgt gcc	653
Thr Val Val Tyr Leu Asp Asp Asn Asp Pro Ile Leu Ile Gly Arg Ala	
160 165 170	
tat gga cga gtt agt cgt gat tta ctt cac gag gag ttg ttg act agg	701
Tyr Gly Arg Val Ser Arg Asp Leu Leu His Glu Glu Leu Leu Thr Arg	
175 180 185	
tgc atg gag tca ggc gtt tca tat ctg agc tcc aaa gtg gaa cgg att	749
Cys Met Glu Ser Gly Val Ser Tyr Leu Ser Ser Lys Val Glu Arg Ile	
190 195 200	
act gaa gct cca aat ggc cta agt ctc ata gag tgt gaa ggc aat atc	797
Thr Glu Ala Pro Asn Gly Leu Ser Leu Ile Glu Cys Glu Gly Asn Ile	

205	210	215	
aca att cca tgc agg ctt gct act gtc gct tct gga gca gct tct gga Thr Ile Pro Cys Arg Leu Ala Thr Val Ala Ser Gly Ala Ala Ser Gly 220 225 230 235			845
aaa ctt ttg cag tat gaa ctt ggc ggt ccc cgt gtt tgc gtt caa aca Lys Leu Leu Gln Tyr Glu Leu Gly Gly Pro Arg Val Cys Val Gln Thr 240 245 250			893
gct tat ggt ata gag gtt gag gtt gaa agc ata ccc tat gat cca agc Ala Tyr Gly Ile Glu Val Glu Val Glu Ser Ile Pro Tyr Asp Pro Ser 255 260 265			941
cta atg gtt ttc atg gat tat aga gac tac acc aaa cat aaa tct caa Leu Met Val Phe Met Asp Tyr Arg Asp Tyr Thr Lys His Lys Ser Gln 270 275 280			989
tca cta gaa gca caa tat cca aca ttt ttg tat gtc atg cca atg tct Ser Leu Glu Ala Gln Tyr Pro Thr Phe Leu Tyr Val Met Pro Met Ser 285 290 295			1037
cca act aaa gta ttc ttt gag gaa act tgt ttg gct tca aaa gag gcc Pro Thr Lys Val Phe Phe Glu Glu Thr Cys Leu Ala Ser Lys Glu Ala 300 305 310 315			1085
atg cct ttt gag tta ttg aag aca aaa ctc atg tca aga tta aag act Met Pro Phe Glu Leu Leu Lys Thr Lys Leu Met Ser Arg Leu Lys Thr 320 325 330			1133
atg ggg atc cga ata acc aaa act tat gaa gag gaa tgg tca tat att Met Gly Ile Arg Ile Thr Lys Thr Tyr Glu Glu Glu Trp Ser Tyr Ile 335 340 345			1181
cca gta ggt gga tcc tta cca aat acc gag caa aag aac ctt gca ttt Pro Val Gly Gly Ser Leu Pro Asn Thr Glu Gln Lys Asn Leu Ala Phe 350 355 360			1229
ggt gct gct gct agc atg gtg cat cca gcc aca gga tat tcg gtt gta Gly Ala Ala Ala Ser Met Val His Pro Ala Thr Gly Tyr Ser Val Val 365 370 375			1277
aga tca ctg tca gaa gct cct aat tat gca gca gta att gca aag att Arg Ser Leu Ser Glu Ala Pro Asn Tyr Ala Ala Val Ile Ala Lys Ile 380 385 390 395			1325
tta ggg aaa gga aat tca aaa cag atg ctt gat cat gga aga tac aca Leu Gly Lys Gly Asn Ser Lys Gln Met Leu Asp His Gly Arg Tyr Thr 400 405 410			1373
acc aac atc tca aag caa gct tgg gaa aca ctt tgg ccc ctt gaa agg Thr Asn Ile Ser Lys Gln Ala Trp Glu Thr Leu Trp Pro Leu Glu Arg 415 420 425			1421
aaa aga cag aga gca ttc ttt ctc ttt gga tta gca ctg att gtc cag Lys Arg Gln Arg Ala Phe Phe Leu Phe Gly Leu Ala Leu Ile Val Gln 430 435 440			1469

atg gat att gag ggg acc cgc aca ttc ttc cgg act ttc ttc cgc ttg 1517
 Met Asp Ile Glu Gly Thr Arg Thr Phe Phe Arg Thr Phe Phe Arg Leu
 445 450 455

ccc aca tgg atg tgg tgg ggg ttt ctt gga tct tcg tta tca tca act 1565
 Pro Thr Trp Met Trp Trp Gly Phe Leu Gly Ser Ser Leu Ser Ser Thr
 460 465 470 475

gac ttg ata ata ttt gcg ttt tac atg ttt atc ata gca ccg cat agc 1613
 Asp Leu Ile Ile Phe Ala Phe Tyr Met Phe Ile Ile Ala Pro His Ser
 480 485 490

ctg aga atg ggt ctg gtt aga cat ttg ctt tct gac ccg aca gga gga 1661
 Leu Arg Met Gly Leu Val Arg His Leu Leu Ser Asp Pro Thr Gly Gly
 495 500 505

aca atg tta aaa gcg tat ctc acg ata taa ataactctag tcgcgatcag 1711
 Thr Met Leu Lys Ala Tyr Leu Thr Ile
 510 515

tttagattat aggcacatct tgcatatata tatgtataaa ccttatgtgt gctgtatcct 1771

tacatcaaca cagtcattaa ttgtatttct tggggtaatg ctgatgaagt attttctgg 1830

<210> 8

<211> 516

<212> PRT

<213> Tagetes erecta

<400> 8

Met Ser Met Arg Ala Gly His Met Thr Ala Thr Met Ala Ala Phe Thr
 1 5 10 15

Cys Pro Arg Phe Met Thr Ser Ile Arg Tyr Thr Lys Gln Ile Lys Cys
 20 25 30

Asn Ala Ala Lys Ser Gln Leu Val Val Lys Gln Glu Ile Glu Glu Glu
 35 40 45

Glu Asp Tyr Val Lys Ala Gly Gly Ser Glu Leu Leu Phe Val Gln Met
 50 55 60

Gln Gln Asn Lys Ser Met Asp Ala Gln Ser Ser Leu Ser Gln Lys Leu
 65 70 75 80

Pro Arg Val Pro Ile Gly Gly Gly Gly Asp Ser Asn Cys Ile Leu Asp
85 90 95

Leu Val Val Ile Gly Cys Gly Pro Ala Gly Leu Ala Leu Ala Gly Glu
100 105 110

Ser Ala Lys Leu Gly Leu Asn Val Ala Leu Ile Gly Pro Asp Leu Pro
115 120 125

Phe Thr Asn Asn Tyr Gly Val Trp Glu Asp Glu Phe Ile Gly Leu Gly
130 135 140

Leu Glu Gly Cys Ile Glu His Val Trp Arg Asp Thr Val Val Tyr Leu
145 150 155 160

Asp Asp Asn Asp Pro Ile Leu Ile Gly Arg Ala Tyr Gly Arg Val Ser
165 170 175

Arg Asp Leu Leu His Glu Glu Leu Leu Thr Arg Cys Met Glu Ser Gly
180 185 190

Val Ser Tyr Leu Ser Ser Lys Val Glu Arg Ile Thr Glu Ala Pro Asn
195 200 205

Gly Leu Ser Leu Ile Glu Cys Glu Gly Asn Ile Thr Ile Pro Cys Arg
210 215 220

Leu Ala Thr Val Ala Ser Gly Ala Ala Ser Gly Lys Leu Leu Gln Tyr
225 230 235 240

Glu Leu Gly Gly Pro Arg Val Cys Val Gln Thr Ala Tyr Gly Ile Glu
245 250 255

Val Glu Val Glu Ser Ile Pro Tyr Asp Pro Ser Leu Met Val Phe Met
260 265 270

Asp Tyr Arg Asp Tyr Thr Lys His Lys Ser Gln Ser Leu Glu Ala Gln
275 280 285

Tyr Pro Thr Phe Leu Tyr Val Met Pro Met Ser Pro Thr Lys Val Phe
290 295 300

Phe Glu Glu Thr Cys Leu Ala Ser Lys Glu Ala Met Pro Phe Glu Leu
305 310 315 320

Leu Lys Thr Lys Leu Met Ser Arg Leu Lys Thr Met Gly Ile Arg Ile
325 330 335

Thr Lys Thr Tyr Glu Glu Glu Trp Ser Tyr Ile Pro Val Gly Gly Ser
340 345 350

Leu Pro Asn Thr Glu Gln Lys Asn Leu Ala Phe Gly Ala Ala Ala Ser
355 360 365

Met Val His Pro Ala Thr Gly Tyr Ser Val Val Arg Ser Leu Ser Glu
370 375 380

Ala Pro Asn Tyr Ala Ala Val Ile Ala Lys Ile Leu Gly Lys Gly Asn
385 390 395 400

Ser Lys Gln Met Leu Asp His Gly Arg Tyr Thr Thr Asn Ile Ser Lys
405 410 415

Gln Ala Trp Glu Thr Leu Trp Pro Leu Glu Arg Lys Arg Gln Arg Ala
420 425 430

Phe Phe Leu Phe Gly Leu Ala Leu Ile Val Gln Met Asp Ile Glu Gly
435 440 445

Thr Arg Thr Phe Phe Arg Thr Phe Phe Arg Leu Pro Thr Trp Met Trp
450 455 460

Trp Gly Phe Leu Gly Ser Ser Leu Ser Ser Thr Asp Leu Ile Ile Phe
465 470 475 480

Ala Phe Tyr Met Phe Ile Ile Ala Pro His Ser Leu Arg Met Gly Leu
485 490 495

Val Arg His Leu Leu Ser Asp Pro Thr Gly Gly Thr Met Leu Lys Ala
500 505 510

Tyr Leu Thr Ile
515

<210> 9

<211> 358

<212> DNA

<213> *Tagetes erecta*

<220>

<221> Promoter

<223> Sense promoter

<400> 9

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aagcttaccg atagtaaaat cgttagttat gattaatact tgggaggtgg gggattatag      60
gctttgttgt gagaatgttg agaaagaggt ttgacaaatc ggtgtttgaa tgagggttaa      120
tggagtttaa ttaaaataaa gagaagagaa agattaagag ggtgatgggg atattaaaga      180
cggccaatat agtgatgcca cgtagaaaaa ggtaagtga aacatacaac gtggctttaa      240
aagatggctt ggctgctaata caactcaact caactcatat cctatccatt caaattcaat      300
tcaattctat tgaatgcaaa gcaaagcaaa gcaaagggtt tttgttggtt ttgtcgac      358

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<210> 10

<211> 445

<212> DNA

<213> *Tagetes erecta*

<220>

<221> misc_feature

<223> Sense fragment

<400> 10

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aagcttgcac gaggcaaagc aaagggttgtt tgttgttgtt gttgagagac actccaatcc      60
aaacagatac aaggcgtgac tggatatttc tctctcgttc ctaacaacag caacgaagaa      120
gaaaaagaat cattaactaac aatcaatgag tatgagagct ggacacatga cggcaacaat      180
ggcggctttt acatgcccta ggtttatgac tagcatcaga tacacgaagc aaattaagtg      240
caacgctgct aaaagccagc tagtcgttaa acaagagatt gaggaggaag aagattatgt      300
gaaagccggt ggatcggagc tgctttttgt tcaaatagcaa cagaataagt ccatggatgc      360
acagtctagc ctatcccaaa agctcccaag ggtaccaata ggaggaggag gagacagtaa      420

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ctgtatactg gatttggttg tcgac

445

<210> 11

<211> 446

<212> DNA

<213> Tagetes erecta

<220>

<221> misc_feature

<223> Antisense fragment

<400> 11

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aaacagatac aaggcgtgac tggatatttc tctctcgttc ctaacaacag caacgaagaa 120

gaaaaagaat cattactaac aatcaatgag tatgagagct ggacacatga cggcaacaat 180

ggcggctttt acatgcccta ggtttatgac tagcatcaga tacacgaagc aaattaagtg 240

caacgctgct aaaagccagc tagtcgttaa acaagagatt gaggaggaag aagattatgt 300

gaaagccggt ggatcggagc tgctttttgt tcaaatgcaa cagaataagt ccatggatgc 360

acagtctagc ctatcccaaa agctcccaag ggtaccaata ggaggaggag gagacagtaa 420

ctgtatactg gatttggttg gatcct 446

<210> 12

<211> 393

<212> DNA

<213> Tagetes erecta

<220>

<221> misc_feature

<223> Sense fragment

<400> 12

aagcttttga ttagcactga ttgtccagat ggatattgag gggaccgcga cattcttccg 60

gactttcttc cgcttgccca catggatgtg gtgggggttt cttggatctt cgttatcacc 120

aactgacttg ataatatttg cgttttacat gtttatcata gcaccgcata gcctgagaat 180

gggtctgggt agacatttgc tttctgaccc gacaggagga acaatgttaa aagcgtatct 240
cacgatataa ataactctag tcgcgatcag tttagattat aggcacatct tgcatatata 300
tatgtataaaa ccttatgtgt gctgtatcct tacatcaaca cagtcattaa ttgtatttct 360
tggggtaatg ctgatgaagt attttctgtc gac 393

<210> 13

<211> 397

<212> DNA

<213> *Tagetes erecta*

<220>

<221> misc_feature

<223> Antisense fragment

<400> 13

gaattctctt tggattagca ctgattgtcc agatggatat tgaggggacc cgcacattct 60
tccggacttt cttccgcttg cccacatgga tgtgggtgggg gtttcttgga tcttcgttat 120
catcaactga cttgataata tttgcgtttt acatgtttat catagcaccg catagcctga 180
gaatgggtct ggtagacat ttgctttctg acccgacagg aggaacaatg ttaaaagcgt 240
atctcacgat ataaataact ctagtcgcga tcagttttaga ttataggcac atcttgcata 300
tatatatgta taaaccttat gtgtgctgta tccttacatc aacacagtca ttaattgtat 360
ttcttggggg aatgctgatg aagtattttc tggatcc 397

<210> 14

<211> 358

<212> DNA

<213> *Tagetes erecta*

<220>

<221> Promoter

<223> Sense promoter

<400> 14

aagcttaccg atagtaaaat cgtagttat gattaatact tgggaggtgg gggattatag 60

gctttgttgt gagaatgttg agaaagaggt ttgacaaatc ggtgtttgaa tgagggttaaa 120
 tggagtttaa ttaaaataaa gagaagagaa agattaagag ggtgatgggg atattaaaga 180
 cggccaatat agtgatgcca cgtagaaaaa ggtaagtga aacatacaac gtggctttaa 240
 aagatggctt ggctgctaata caactcaact caactcatat cctatccatt caaattcaat 300
 tcaattctat tgaatgcaaa gcaaagcaaa gcaaagggtt tttgttggtt ttgtcgac 358

<210> 15

<211> 361

<212> DNA

<213> *Tagetes erecta*

<220>

<221> promoter

<223> Antisense promoter

<400> 15

ctcgagctta ccgatagtaa aatcgtagt tatgattaat acttgggagg tgggggatta 60
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 aaatggagtt taattaaaat aaagagaaga gaaagattaa gagggatgat gggatattaa 180
 agacggccaa tatagtgatg ccacgtagaa aaaggtaagt gaaaacatac aacgtggctt 240
 taaaagatgg cttggctgct aatcaactca actcaactca taccctatcc attcaaattc 300
 aattcaattc tattgaatgc aaagcaaagc aaagcaaagg ttgtttgttg ttgttggatc 360
 c 361

<210> 16

<211> 332

<212> DNA

<213> *Tagetes erecta*

<220>

<221> CDS

<222> (1) .. (330)

<400> 16

aag ctt gca cga gcc tct ctc tat ttt tac act tca atg gcg gca gca 48
Lys Leu Ala Arg Ala Ser Leu Tyr Phe Tyr Thr Ser Met Ala Ala Ala
1 5 10 15

att gct gtc cct tgt agc tca aga cca ttt ggc tta ggt cga atg cgg 96
Ile Ala Val Pro Cys Ser Ser Arg Pro Phe Gly Leu Gly Arg Met Arg
20 25 30

tta ctt ggt cat aaa ccc aca acc ata act tgt cac ttc ccc ttt tct 144
Leu Leu Gly His Lys Pro Thr Thr Ile Thr Cys His Phe Pro Phe Ser
35 40 45

ttt tct atc aaa tca ttt acc cca att gtt agg ggc aga aga tgt act 192
Phe Ser Ile Lys Ser Phe Thr Pro Ile Val Arg Gly Arg Arg Cys Thr
50 55 60

gtt tgt ttt gtt gcc ggt ggc gac agt aat agt aac agt aat aat aat 240
Val Cys Phe Val Ala Gly Gly Asp Ser Asn Ser Asn Ser Asn Asn Asn
65 70 75 80

agt gac agt aat agt aat aat ccg ggt ctg gat tta aac ccg gcg gtt 288
Ser Asp Ser Asn Ser Asn Asn Pro Gly Leu Asp Leu Asn Pro Ala Val
85 90 95

atg aac cgt aac cgt ttg gtt gaa gaa aaa atg gag agg tcg ac 332
Met Asn Arg Asn Arg Leu Val Glu Glu Lys Met Glu Arg Ser
100 105 110

<210> 17

<211> 110

<212> PRT

<213> Tagetes erecta

<400> 17

Lys Leu Ala Arg Ala Ser Leu Tyr Phe Tyr Thr Ser Met Ala Ala Ala
1 5 10 15

Ile Ala Val Pro Cys Ser Ser Arg Pro Phe Gly Leu Gly Arg Met Arg
20 25 30

Leu Leu Gly His Lys Pro Thr Thr Ile Thr Cys His Phe Pro Phe Ser
35 40 45

Phe Ser Ile Lys Ser Phe Thr Pro Ile Val Arg Gly Arg Arg Cys Thr
50 55 60

Val Cys Phe Val Ala Gly Gly Asp Ser Asn Ser Asn Ser Asn Asn Asn

65

70

75

80

Ser Asp Ser Asn Ser Asn Asn Pro Gly Leu Asp Leu Asn Pro Ala Val
 85 90 95

Met Asn Arg Asn Arg Leu Val Glu Glu Lys Met Glu Arg Ser
 100 105 110

<210> 18

<211> 332

<212> DNA

<213> Tagetes erceta

<220>

<221> misc_feature

<223> beta-Hydroxylase sense fragment

<400> 18

aagcttgac gagcctctct ctatcttttac acttcaatgg cggcagcaat tgctgtccct 60
 tgtagctcaa gaccatttgg cttaggtcga atgcggttac ttggtcataa acccacaacc 120
 ataacttgtc acttccccctt ttctttttct atcaaatcat ttaccccaat tgtagggggc 180
 agaagaatgta ctgtttgttt tgttgccggt ggcgacagta atagtaacag taataataat 240
 agtgacagta atagtaataa tccgggtctg gatttaaacc cggcggttat gaaccgtaac 300
 cgtttgggtg aagaaaaaat ggagaggtcg ac 332

<210> 19

<211> 332

<212> DNA

<213> Tagetes erecta

<220>

<221> misc_feature

<223> beta-Hydroxylase antisense fragment

<400> 19

gaattcggca cgagcctctc tctatcttta cacttcaatg gcggcagcaa ttgctgtccc 60

ttgtagctca agaccatttg gcttaggtcg aatgcgggta cttgggtcata aaccacacaac	120
cataacttgt cacttcccct tttcttttttc tatcaaatca tttaccccaa ttgttagggg	180
cagaagatgt actgtttgtt ttgttgccgg tggcgacagt aatagtaaca gtaataataa	240
tagtgacagt aatagtaata atccgggtct ggatttaaac ccggcggtta tgaaccgtaa	300
ccgtttgggtt gaagaaaaaa tggagaggat cc	332

<210> 20

<211> 19

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 20

tgccaaagta actctttat

19

<210> 21

<211> 19

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 21

aggtgcatga ccaagtaac

19

<210> 22

<211> 1033

<212> DNA

<213> Lycopersicon esculentum

<220>

<221> Promoter

<400> 22

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aggtgcatga ccaagtaaca atttgattcc tttccagcat aacgtcatgt tggttgcaaa    60
aagaaggcaa agtagagcaa gcaagcaagc aaagcatttt tcttatttta tattttgttg    120
cggattccac caccacttg aaaaattgac atgtcacaat gatttcgtat cctagtcttt    180
tattatttaa cactctcaca atcccattac tctacacctc tttcattaag tcaacacacg    240
gttttcaaaa atccactacc ctcccaccac ctagaatctt ttgttaccta ccaacaccct    300
cctttgttct ctttatatat tgggtccaact aaatcaataa gggaaagcat ccttttggtt    360
ggaggaattg ctttcattct cactctttgt gtgttgatca atggactagc taataacaag    420
ttctctctct atatatttca aaagaatgga acagaaacat aaacgaaaga cagagtacct    480
gatgttgatg attcattgtc tgtctggagc tcccaaatgc cttttatgct tacatattca    540
taaccaacaa cggctattaa ttataaacca aaaacacgaa ataagtttgt agcaaagtga    600
aattaggaat cttggagatg gatccattag tagtaggata ataggatatg atggaatttg    660
gttggggaac agtgataact tacgcttgct tccggcgccg ggaaagttag aaaacctaca    720
aagtacagaa atggatctgg gccttgaagt gggcttttta ttaaagaaaa aaatacatct    780
ccgttatcaa tcaccatctt cttctatcta caaattaaag aaggtaacaa cagaacgtgg    840
tggatcatgt ggtaggcat taattatttg ctttgtttcg ccgttttggt aacacacaga    900
cacagttccg gtaagagctt ttgcagccac tctttatagt tatttagaat tggcgatcga    960
atcaatctca ctccctccct cccttaagtc ttgttgaatc tgetgaattg ttttataaag   1020
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<210> 23

<211> 18

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 23

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atggaagctc ttctcaag                                           18

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<210> 24

<211> 22

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 24

ctattgctag attgccaatc ag

22

<210> 25

<211> 28

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 25

gagctcactc actgatttcc attgcttg

28

<210> 26

<211> 37

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 26

cgccgttaag tcgatgtccg ttgatttaaa cagtgtc

37

<210> 27

<211> 34

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 27

atcaacggac atcgacttaa cggcgtttgt aaac

34

<210> 28

<211> 25

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 28

taagcttttt gttgaagaga tttgg

25

<210> 29

<211> 23

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 29

gaaaataactt catcagcatt acc

23

<210> 30

<211> 28

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 30

gtcgactacg taagtttctg cttctacc

28

<210> 31

<211> 26

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 31

ggatccggtg atacctgcac atcaac

26

<210> 32

<211> 28

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 32

aagcttgcac gaggcaaagc aaaggttg

28

<210> 33

<211> 29

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 33

gtcgacaacc aaatccagta tacagttac

29

<210> 34

<211> 30

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 34

aggatccaac caaatccagt atacagttac

30

<210> 35

<211> 28

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 35

gaattcgac gaggcaaagc aaagggtg

28

<210> 36

<211> 25

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 36

aagctttgga ttagcactga ttgtc

25

<210> 37

<211> 29

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 37

gtcgacagaa aatacttcat cagcattac

29

<210> 38

<211> 29

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 38

ggatccagaa aatacttcat cagcattac

29

<210> 39

<211> 27

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 39

gaattctctt tggattagca ctgattg

27

<210> 40

<211> 23

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 40

cgccttgtat ctgtttggat tgg

23

<210> 41

<211> 24

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 41
ctaacaatca atgagtatga gagc

24

<210> 42

<211> 26

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 42
agagcaaggc cagcaggacc acaacc

26

<210> 43

<211> 26

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 43
ccttgggagc ttttgggata ggctag

26

<210> 44

<211> 26

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 44
tcacgccttg tatctgtttg gattgg

26

<210> 45

<211> 15

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 45

gtcgagtatg gagtt

15

<210> 46

<211> 28

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 46

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28

<210> 47

<211> 31

<212> DNA

<213> Artificial sequence

<220>

<223> Primer

<400> 47

ctcgagctta ccgatatgtaa aatcgttagt t

31

<210> 48

<211> 28

<212> DNA

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<220>

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